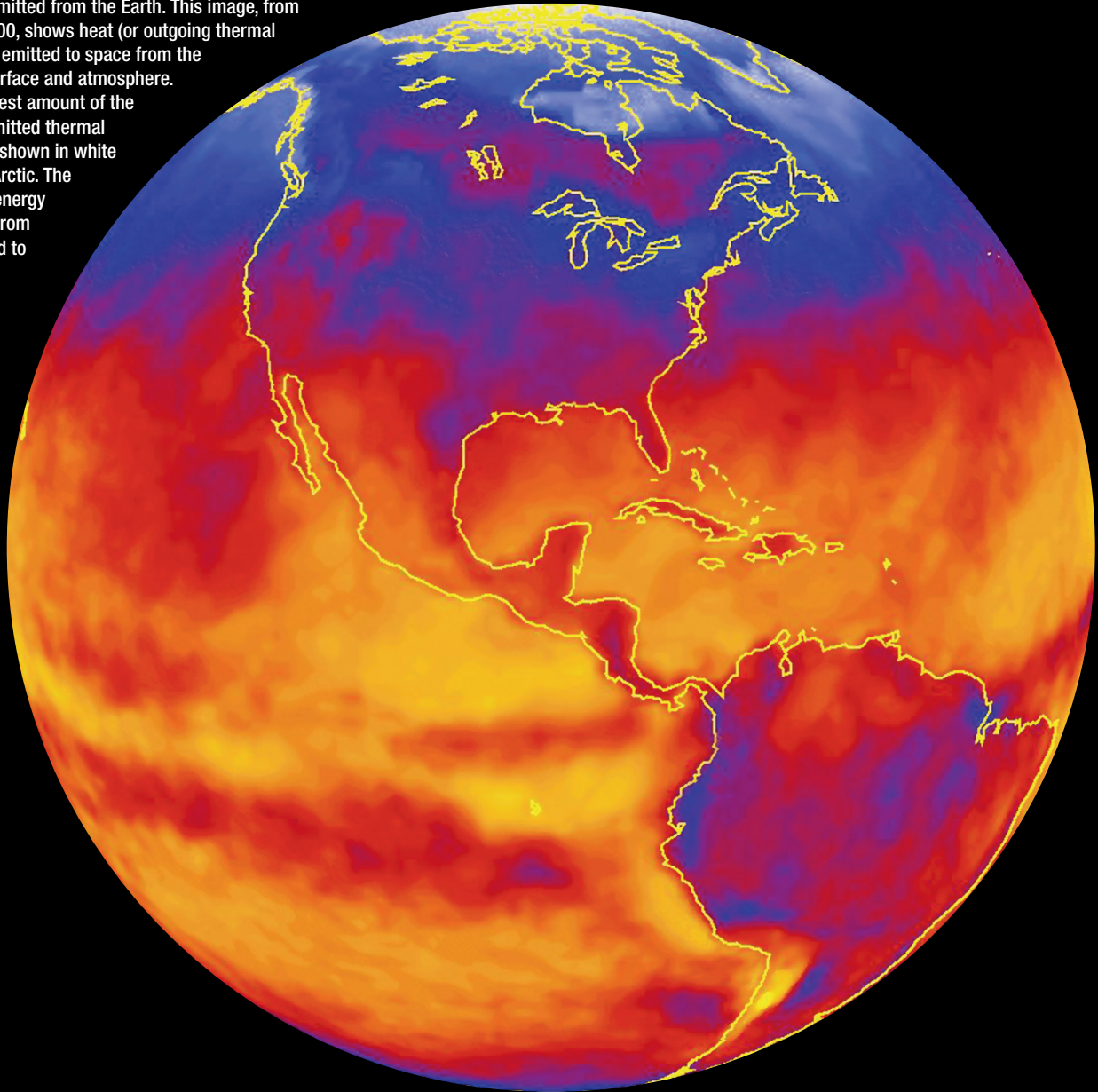


EYES ON ENERGY

The Clouds and the Earth's Radiant Energy System (CERES) instrument measures the thermal energy, or heat, emitted from the Earth. This image, from March 2000, shows heat (or outgoing thermal radiation) emitted to space from the Earth's surface and atmosphere. The smallest amount of the Earth's emitted thermal energy is shown in white over the Arctic. The levels of energy increase from blue to red to yellow.



Using the unique vantage point of space, current and future NASA satellites are able to view the entire globe and can supplement existing surface measurement networks and data information products. Development of decision support systems for energy forecasting will impact government and industrial organizations at all levels.





EYES ON ENERGY

Overview of the Program

At present, an array of Earth observing satellites are in orbit, and additional launches both by NASA and others will continue throughout the next decade. Our ability to observe our home planet from space has never been greater and will continue to grow. Increasingly, studies of the Earth focus on understanding the Earth's land, atmosphere, oceans, and life as a single integrated system rather than as individual independent elements. NASA is an important contributor in this systems approach to Earth science studies.

In addition to providing Earth observing capabilities, NASA forms strategic partnerships with other government, academic, private, and international organizations. Through these partnerships NASA's Earth science observations and measurements are linked to practical applications. NASA data, information, and predictive models help NASA's partners, and non-traditional users of Earth science, make timely and accurate decisions regarding management of resources and development of policy and maximize the impact of NASA science and technology to benefit society. The goal is ***to make Earth science data and information flow smoothly from satellite to society.***

Renewable Energy Resources

Our nation is critically dependent on stable and reliable sources of energy. Traditionally, much of this demand has been met by burning fossil fuels such as oil, coal, and natural gas, but in recent years, considerable evidence has been amassed that these fuels can impact our environment, and alternative sources of fuel have been explored. Nuclear energy has been put forth as a cleaner alternative and used successfully in a few places but this source is not without its own set of environmental concerns. Other alternatives to fossil fuels are now emerging, including renewable energy technologies (RETs) like solar energy and wind power, and biomass fuels such as corn-based ethanol and other species under development. These alternative fuel sources can help reduce mankind's dependence on fossil fuels and, at the same time, may help to improve our quality of air.

For these alternative fuel sources to obtain their fullest potential, however, planners require very detailed climatic data. A traditional weather report is no longer sufficient. In order to optimize the effectiveness of these RETs, planners need to know precise details about the makeup of the incoming solar radiation, the prevailing wind speed and direction, and the actual temperature at the surface. Not only must the information be accurate and timely, it must be collected on a global scale. To date, the energy sector has based their decisions on where to locate energy producing technology, such as RETs, on historical climatic information. However, it is much more desirable to know how the conditions at a chosen location are likely to change with time. NASA and its partners at the Department

of Energy (DOE), the DOE's National Renewable Energy Laboratory (NREL), the National Oceanic and Atmospheric Administration (NOAA), and U.S. Department of Agriculture (USDA), are working to respond to these needs.

A major component of NASA's Science Mission Directorate is dedicated to understanding the Earth's energy and hydrological cycles on a global scale using remote sensing and modeling. NASA already has developed a unique web-based climatological information system linked to a DSS (eosweb.larc.nasa.gov/sse). Over 10,000 individuals from government agencies, universities, and private sector industry use this system to meet data requirements for renewable energy projects. The Clouds and the Earth's Radiant Energy System (CERES) sensor, on the Tropical Rainfall Measuring Mission (TRMM), Terra and Aqua, provides input to this system. CERES studies major elements of Earth's water cycle (clouds) and energy balance. In addition to CERES, the Aqua mission carries an entire sensor package dedicated to studying water in the Earth/atmosphere system, and TRMM contributes extensive information on precipitation. The Global Precipitation Measurement (GPM) mission, a constellation of satellites provided by NASA and its international partners, scheduled to begin launching in 2008, will contribute even more to our understanding of global precipitation patterns. Two additional upcoming missions will make important contributions to improved energy forecasting. CloudSat will collect a comprehensive inventory of clouds and provide information to study their impacts on climate in unprecedented detail, and Cloud-Aerosol Lidar Infrared Pathfinder Satellite Observations (CALIPSO) will study the role that aerosols play in regulating climate. Better understanding of the role clouds and aerosols play in regulating climate will have profound implications for energy forecasting efforts. With all of its current and future missions, NASA is collecting data on important parameters for energy forecasting over the entire globe. This information can supplement existing surface measurement networks and data information products, providing data where none is available.

But the story doesn't end with the collection of the data. As more data from increasingly sophisticated NASA missions become available, forecasting capabilities are expected to increase quite dramatically. Weather forecasts should improve from today's fairly reliable 3–5 day forecasts to dependable 5–7 day forecasts by 2010. Seasonal predictions will also become increasingly accurate and useful for planning. These improvements will result in increased capability to plan for and respond to the ever-increasing energy demands of our society.

NASA's Earth Science studies are international in scope with participation by the U.S., the European Space Agency, France, Canada, Japan, Russia, Brazil, The Netherlands, and Finland. NASA works collaboratively with national and international scientists as well as with its Federal partners to provide quality science observations and predictions as input into renewable energy resource forecasting models. NASA is committed to expanding the use of Earth Science results to serve as decision support tools for the benefit of society.